DQO Step				
	Medium:	***Soil on Southern Parcels***		
	Investigation Phase:	***Phase 1A***	***Phase 1B***	***Phase 2***
	Investigation Item:	***Comparison to Industrial Soil Criteria and Site-Specific Risk Values***	***Comparison to Background Reference Conditions***	***Additional sampling (if necessary) to develop risk assessment exposure estimates***
1	***State the Problem***			
	i) Problem description	Insufficient soil quality data exist for OU2 in order to determine: - The presence or absence of direct contact, ingestion, and inhalation risks to receptors via soil and/or fill exposure pathways. - The nature and lateral and vertical extent of the fill material. - The nature and extent of contaminated soil.	- Insufficient soil quality data exist for OU2 in order to determine whether potential soil contamination is a result of migration from the Site or off-Site sources.	If soil containing contaminants at concentrations greater than screening values and background reference conditions is found in Phases 1A and 1B for Southern Parcels, additional soil samples will be collected to delineate soil impacts or to remove data gaps. The quantity of data must be sufficient to support a risk assessment.
	ii) Planning team	See note at bottom		
	iii) Conceptual model	Fill was placed in a portion of the southern parcels. The fill includes but may not be limited to CDD. OU2 soil may have site-related contaminants from wind-blown deposition, run-off, groundwater leaching, (regrading?...) - Contaminants in soil may pose a risk to receptors via the direct contact, inhalation and ingestion pathways. Cover material at the Site is limited or non-existent, which could lead to erosional run-off of contaminants towards the Quarry Pond - Infiltrating precipitation can cause contaminants in soil and fill to migrate downwards, ultimately impacting groundwater.		
	iv) General intended use for data	The data collected will be compared against health-based risk values and applicable USEPA Industrial Soil Regional Screening Levels (RSLs) to identify risks associated with soil samples. The soil data collected from each soil borehole will be used to identify direct contact risks associated with soil from the Southern Parcels.	The data collected from sampling locations in the Southern Parcels will be compared to background conditions, to determine if there are measurable inputs of contaminants from the Site. The data collected will ultimately be used in the Baseline Risk Assessment for OU2.	The collected data will be used to generate exposure estimates for an assessment of direct contact risks, groundwater contamination, and risks to ecological receptors. The data collected will ultimately be used in the Baseline Risk Assessment for OU2.
	v) Resources, constraints, deadlines	Sufficient resources will be committed to sample soil on the Southern Parcels under the OU2 RI/FS work plan. Sampling may be postponed due to flooding.		
2	***Goals of the Study:***			

i) Primary study question	Do soil and fill samples from the Southern Parcels contain contaminants at concentrations greater than industrial or residential soil, groundwater protection, and/or site-specific risk-based values?	Are contaminant concentrations due to Site activities or locally occurring background concentrations?	Does soil on the Southern Parcels contain contaminants originating from the Site that may pose unacceptable human health risks or unacceptable risks to ecological receptors?
ii) Alternate outcomes or actions	- If sampling demonstrates that contaminant concentrations in soil and fill are less than risk-based screening levels/criteria, no further sampling or remedial action is planned.- If sampling demonstrates that contaminant concentrations in soils or fill are greater than screening levels/criteria, further evaluation is needed to determine the contamination's origin, risk to human health and the environment, and/or remedial measures.	- If sampling demonstrates contaminant concentrations on the Southern Parcels are not greater than those found in background reference soils, no further sampling is planned.	- If sampling demonstrates that human health and ecological risks are acceptable, no further action is required.- If sampling demonstrates unacceptable human health or ecological risks, further evaluation, risk management and/or remediation would be required.
iii) Type of problem (decision or estimation)[1]	Decision (Action Level)	Decision (Action Level)	Estimation
iv.a) Decision statement	Determine whether any contaminant concentrations are greater than USEPA Industrial or residential soil RSLs criteria or site-specific risk values in Southern Parcel soils.	Determine whether any measurable input of contaminants from the Site, relative to background reference conditions, occurs in soil in the Southern Parcels.	Determine where contaminant concentrations require further consideration or response action, and where no further investigation is necessary.
iv.b) Estimation statement & assumptions	--	--	The parameter of interest is the mean (for estimating direct contact risks) of soil contaminant concentrations within an identified exposure area on the Southern Parcels.

3 ***Identify Information Inputs:***

i) Information types needed	- Soil sample analysis is required to assess conditions in the Southern Parcels. - Soil samples will be collected on a random basis (random oriented grid) from each exposure area. - Soil samples will also be collected at data gap locations or areas of suspected soil contamination.	- This would be a supplemental data collection effort, with analyses performed on soil samples obtained to fill in any data gaps across the exposure area.

ii) Information sources	- New and existing data from the investigation will form the basis of assessment. The results from all soil samples collected from the Southern Parcels will be considered during interpretation of the data obtained.	- New data from the investigation will form the basis of assessment. Any available previous data (e.g., from Phase 1), within the exposure area will also be used.
iii) Basis of Action Level	Action Levels are: - USEPA Industrial and Residential Soil RSLs The data collected will be compared against health-based risk values and applicable USEPA Industrial Soil Regional Screening Levels (RSLs) to identify risks associated with soil samples from the Southern Parcels.	--
iv) Appropriate sampling & analysis methods	Methods are described in the Field Sampling Plan (CRA, January 2011) and the Quality Assurance Project Plan (CRA, September 2008).	

4 ***Define the Boundaries of the Study:***

i) Target population, sample units	The target population is surficial and subsurface soils, initially on the Southern Parcels. The sampling units are individual samples collected from the soil, divided into background reference, and exposure units for assessment of risks to human receptors.		Target population is soil exceeding screening levels and comprising the exposure units for assessment of exposure risks for human receptors.
ii) Specify spatial boundaries	The spatial boundaries are the limits of site-related soil and fill contamination. Surficial soil is to a maximum depth of 2 ft bgs. The spatial boundaries of the sub-surface soil samples will be to a depth of 15 ft bgs, i.e., the maximum soil depth construction workers would be expected to encounter. Additional unsaturated soil samples will be collected at depths greater than 15 ft bgs. Boreholes will be advanced up to 5 ft into native material, to the base of landfill waste, the water table, or until refusal.	Background reference surface and subsurface sampling locations will be identified in areas outside a reasonable zone of potential influence (via surface runoff or substantial airborne dust deposition) for the Site. Distance from the Site and prevailing wind directions will be considered in making this determination.	The spatial boundaries are the limits of the Southern Parcels (OU2) Site boundaries. Surficial soil is to a maximum depth of 2 ft bgs. The spatial boundaries of the sub-surface soil samples will be to a maximum depth of 15 ft bgs, i.e., the maximum soil depth construction workers would be expected to encounter. The spatial boundaries to evaluate risks to groundwater will be the entire depth of soil above the water table.
iii) Specify temporal boundaries	The temporal boundaries are indefinite, assuming continued exposure at levels found during sampling. The practical temporal limits are based on the exposure assumptions of the Action Levels.		

iv) Identify any other practical constraints	Practical constraints anticipated for sampling of Southern Parcel soil include the presence of cars on the Jim City Parcels and buildings and equipment on the Ron Barnett Parcels. Safety issues associated with sampling adjacent to surface water will also be considered for sampling activities on the Quarry Pond Parcels.	If different surficial soil substrates are encountered (e.g., silt vs. sand vs. clay), these differences may require additional sampling (e.g., further reference samples) to appropriately evaluate potential Site-related impacts. Off-Site sampling may be restricted by permission of property owners, and availability of suitable locations for background locations.	Practical constraints anticipated for sampling of Southern Parcels soil include the presence of cars on the Jim City Parcels and buildings and equipment on the Ron Barnett Parcels. Off-Site sampling, if required for delineation purposes, may be restricted by permission of property owners.
v.a) Scale of inference for decision making	Comparisons to Action Levels will be carried out on an individual-location basis.	Comparisons to background reference conditions will be carried out on an individual-location basis.	--
v.b) Scale of estimates	--		The scale of the exposure estimate is to be identified in a Site-specific risk assessment.

5 ***Develop the Analytic Approach:***

i.a) Specify Action Level	1) USEPA Industrial, residential, and protection of groundwater Soil RSLs	Background Threshold Values based on background reference data, following USEPA's ProUCL Technical Guide (2010)	--
i.b) Specify estimator	--		The arithmetic mean (per USEPA RAGS requirements) surface soil concentration of each contaminant that is greater than screening criteria.
ii.a) Specify population parameter of interest and theoretical decision rule	Individual observations at sampling locations on the Southern Parcels.		--
ii.b) Specify estimation procedure	--		The study will estimate the mean concentration of the exposure unit population represented by the soil samples obtained.

6 ***Specify Performance or Acceptance Criteria:***

i.a) Set baseline (null) and alternative hypotheses	Baseline H_0: soil sample concentrations are less than Action Levels. Alternative H_1: soil samples contain contaminant concentrations greater than Action Levels.	Baseline H_0: soil sample concentrations from the Southern Parcels are no different than reference background concentrations Alternative H_1: soil samples from the Southern Parcels contain contaminants at concentrations greater than reference conditions.	--
i.b) Specify how uncertainty accounted for in estimate	--		Uncertainty will be accounted for using a confidence interval on the population mean (per USEPA RAGS guidance).
ii.a) Determine impact of decision errors (false positives/negatives)	N/A: no statistical test is employed (direct comparison to Action Levels)	- If a false positive (Type I) error occurs, unnecessary additional investigation (Phase 2) may occur. - If a false negative (Type II) error occurs, conditions that are not due to background contaminant concentrations and pose potential health risks to receptors persist.	--
ii.b) Specify confidence level for estimate	--		The confidence level of the estimate will be 95 percent, unless specified otherwise (based on data distribution and/or the presence of non-detect results) in USEPA's ProUCL Technical Guide (2010).
iii) Specify "gray region" for test	N/A: no statistical test is employed (direct comparison to Action Levels)	N/A: since comparing individual concentrations against reference conditions, no statistical test is employed.	--
iv.a) Set tolerable limits on decision errors	N/A: no statistical test is employed (direct comparison to Action Levels)	The Background Threshold Values will be calculated using a 95 percent confidence level, making the false positive rate no greater than 5 percent. Limits on the false negative rate are not appropriate for comparisons of individual results to threshold values.	--

iv.b) Specify performance or acceptance criteria	--		The lesser value of the 95 percent UCL on the population mean or the maximum individual measurement will be required.

7 ***Develop the Plan for Obtaining Data:***

i) Select sampling design	Soil samples from Southern Parcels will be collected from four exposure areas (Jim City Parcels, Ron Barnett Parcels, Quarry Pond Parcel soil, Quarry Pond embankments including Parcel 3275). Exposure areas are determined based on current use and ownership, potential future use, and topography.	Background surface and subsurface reference samples will be collected at 10 locations to provide a suitable data set (per USEPA's ProUCL Technical Guide, 2010) for the calculation of Background Threshold Values. Soil samples from the Southern Parcels will be collected as described in Phase 1A (see left).	The number of additional soil samples required, for delineation purposes and removal of data gaps, will be determined based on the results of the Phase 1A and 1B investigations.
	Separate sets of data will be collected for (i) surface soil 0-2', (ii) subsurface soil 2-15', and (iii) unsaturated samples from a minimum of 12 locations at depths greater than 15 ft bgs. Additional soil samples will be collected at intervals within boreholes exhibiting evidence of contamination (based on field screening, visual and olfactory observations) A minimum of 8 samples per exposure area, per USEPA's ProUCL Technical Guide (2010), spaced on a regular grid with random origin (i.e., a systematic random sampling design), will be obtained for each exposure area identified in the risk assessment. Additional samples will be collected in the areas of any data gaps. A minimum of 10 samples will be collected from sub-surface soil (2-15'). Additional samples wll be collected from subsurface soil		

	(>15' at 3 locations per exposure area and additional locations) if impacts are identified.		
ii) Specify/evaluate key assumptions supporting the design	The calculation of 95 percent upper confidence limits on a population mean makes assumptions of data characteristics (e.g., distribution and proportion of detected values), as fully discussed in the USEPA ProUCL Technical Guide (2010). Additionally, the presence of outlying values will be tested, and if present their impact on the values obtained evaluated.	The calculation of Background Threshold Values (statistical limits on an upper percentile, e.g. 95th) for the reference population of surficial soils depends on data characteristics (e.g., distribution and proportion of detected values), as fully discussed in the USEPA ProUCL Technical Guide (2010). Additionally, the presence of outlying values will be tested, and if present their impact on the values obtained evaluated.	The calculation of 95 percent upper confidence limits on a population mean makes assumptions of data characteristics (e.g., distribution and proportion of detected values), as fully discussed in the USEPA ProUCL Technical Guide (2010). Additionally, the presence of outlying values will be tested, and if present their impact on the values obtained evaluated.